MANUAL

MODERN GUM NAVAL STORES METHODS

by

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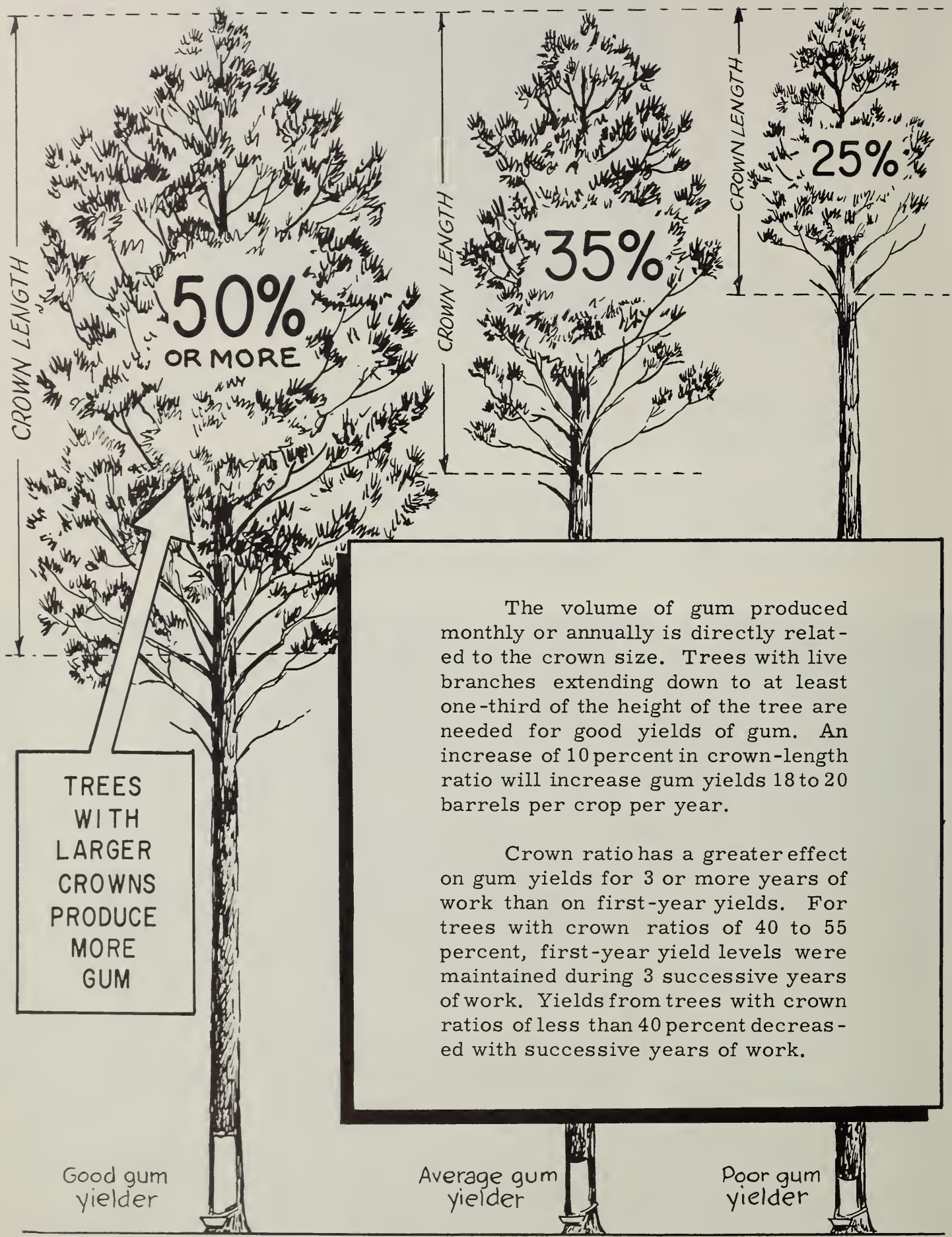
INTRODUCTION

Modern gum naval stores methods have been developed to benefit both the gum producer and the timber owner. Following the methods described in this booklet will bring maximum gum yields, will reduce chipping-labor requirements about 50 percent, and will make the worked-out tree saleable for other wood products.

If these modern turpentining methods are used, naval stores can be integrated in the management plan for pine timbered lands, and timber owners can almost double the dollar value per tree by leasing or working for naval stores before they harvest.

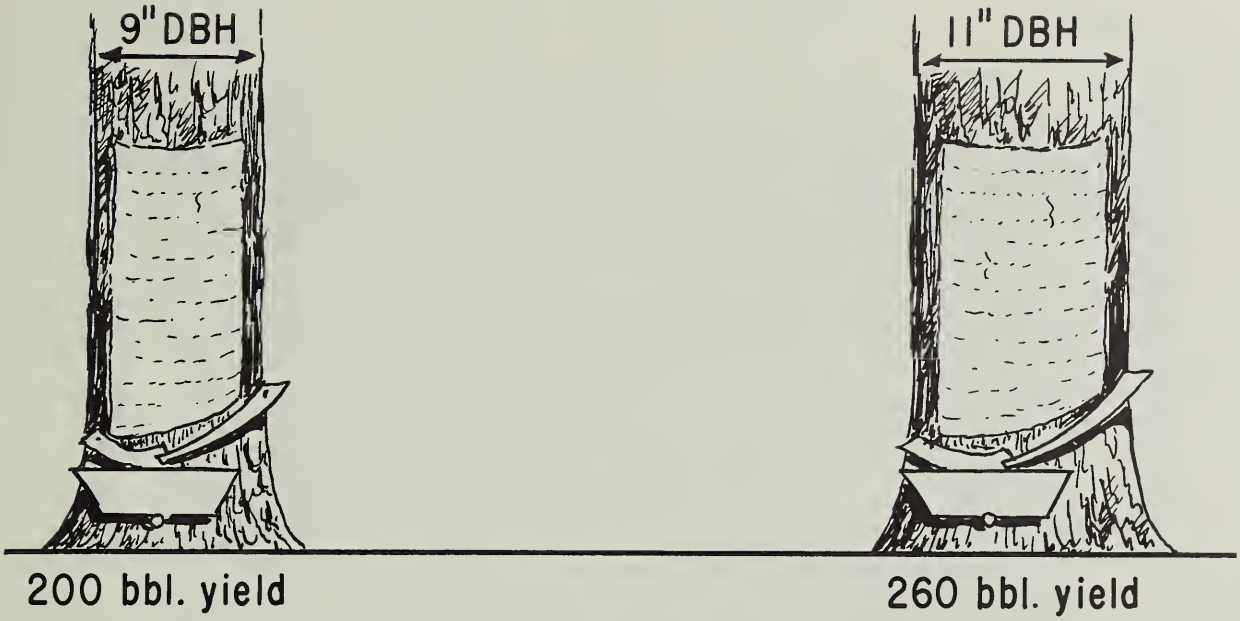
The aim of this booklet is to bring together in one place all the best modern methods of producing gum, and to describe the principal factors that affect gum flow.

The extraction methods and application techniques described here were developed during 15 years of research and testing by scientists at the Lake City Research Center with the cooperation of gum producers and timber owners throughout the gum naval stores belt.



The volume of gum produced monthly or annually is directly related to the crown size. Trees with live branches extending down to at least one-third of the height of the tree are needed for good yields of gum. An increase of 10 percent in crown-length ratio will increase gum yields 18 to 20 barrels per crop per year.

Crown ratio has a greater effect on gum yields for 3 or more years of work than on first-year yields. For trees with crown ratios of 40 to 55 percent, first-year yield levels were maintained during 3 successive years of work. Yields from trees with crown ratios of less than 40 percent decreased with successive years of work.

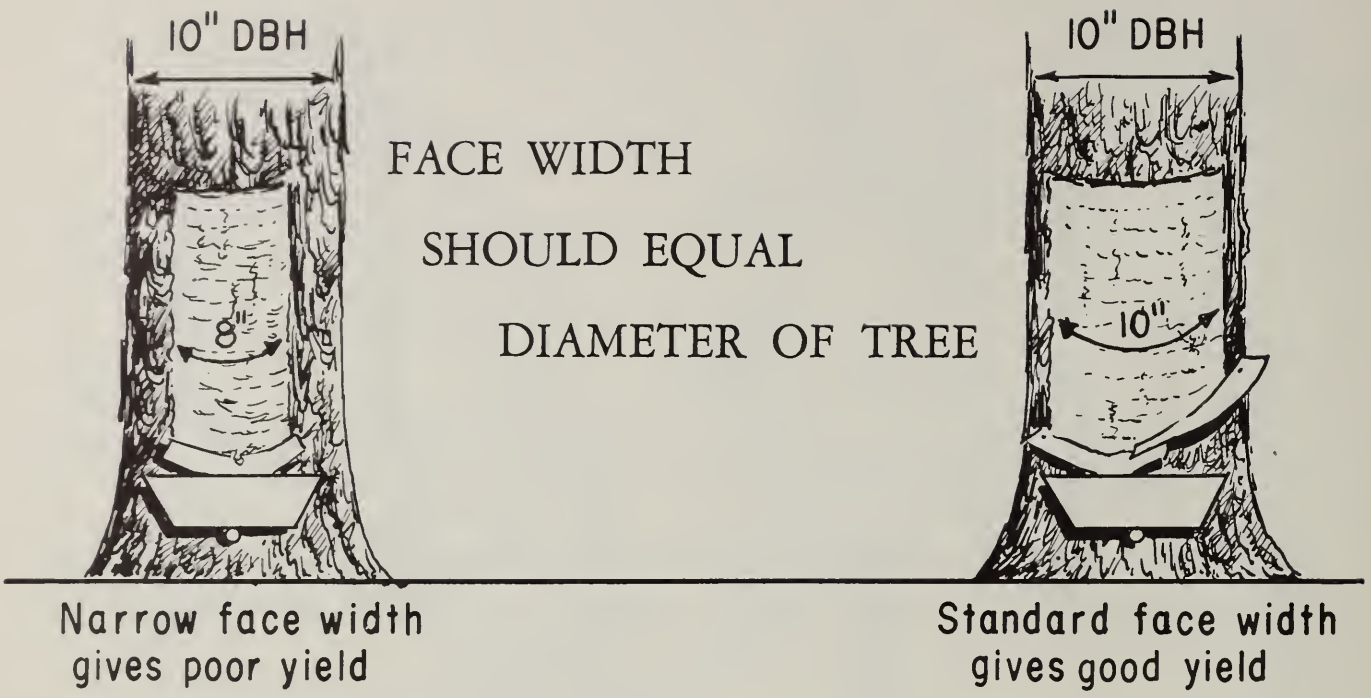


CUP THE LARGER-DIAMETER TREES FOR INCREASED YIELDS AND GREATER PROFITS

A crop of single-faced trees 11 inches in diameter will produce 60 barrels more gum per year than 9-inch trees. The costs for installing tins and for chipping are about the same for 9- and 11-inch trees. The number of small-diameter trees worked can be the difference between break-even and profitable operation.

Double-facing. --Only one face per tree should be installed on trees smaller than 14 inches in diameter. Simultaneous working of two faces installed on one tree does not mean that gum yields from that particular tree will double. The yield from two faces worked simultaneously is normally not more than 70 percent of the yield which could have been obtained from two faces worked one at a time.

Two faces should be installed on trees 14 inches d. b. h. and over for obtaining the greatest yield if the trees are to be worked out in 4 years.



The volume of gum produced is directly related to the width of the face. Good gum yields can be obtained with a face width equal to the diameter of the tree measured at breast height. For example, a 10-inch tree should have a 10-inch face and a 12-inch tree a 12-inch face.

Gum yield from shoulders. --With bark chipping and acid treatment, 75 percent of the gum yield at each dipping flows from the shoulders of the face. If careless chipping extends the streak $\frac{1}{2}$ inch beyond the range of the tins on each side of the face, a barrel of gum is wasted during the season for every 310 trees worked.

Use correct tin lengths. --One-piece tin assemblies or broadaxe inserted tins will not give full face widths on 12-inch trees and larger. For full face widths and good gum yields, use 10-inch spiral gutters on trees 9 to 12 inches in diameter. Use 12-inch spirals on trees 12 to 16 inches in diameter. For an apron, use a 7- or 8-inch straight or curved gutter with either length.

FIRST-YEAR INSTALLATION OF SPIRAL GUTTERS WITH DOUBLE-HEADED NAILS

STEP 1

Shaving the bark. --Shave off the rough bark using double-edge, shove-down scrape iron or a bark-shave tool. Shave only the area where the tins will be nailed and the cup will sit. Shave a fairly flat seat for the apron and cup; keep the spiral gutter side of the tree round. Remove enough bark to get rid of the deep cracks.

STEP 2

Attach the apron first. --Drive the first nail at the middle of the apron. Level the apron and drive the second nail in the left shoulder. Set this nail close to the end of the tin so as to get full face width. Drive all nails near the top edge of the tins; this pulls the edge into the bark to prevent leakage behind the tins. Pound the inner lip of the right-hand end of the apron so that it fits snugly against the tree. Do not nail the right-hand end at this stage.

Use only double-headed nails designed specially for attaching and removing naval stores tins.

STEP 3

Attaching the spiral gutter.--Lap the lower end of the spiral gutter over the right-hand end of the apron. Set the angle of the spiral between 30 and 40 degrees--around 30 for slash and steeper for longleaf pine. Drive the first nail in the middle of the spiral. Drive the next nail through both the spiral gutter and the apron at the overlap. Drive the shoulder nail last. Close any gaps between the gutter and the bark by pounding the inner edge of the gutter into the bark.

COMPLETED INSTALLATION

The double-headed nails are numbered in the photograph to show the order in which they are driven. To support a large 2-quart cup, a 30d flat-head nail is used. A standard-size cup takes a 20d nail. Drive the cup nail at a slight angle so outer edge of cup will snap over nail head. This holds cup snugly against tree.

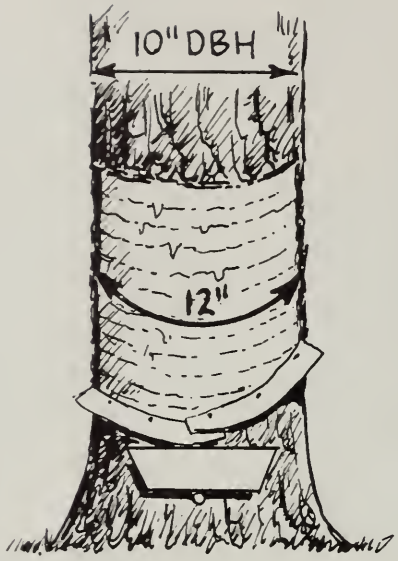
USE OF THE ADVANCED STREAK

With bark chipping and acid treatment, the familiar "lead" or advance streak is not necessary, as it will not increase the volume of gum produced the first year from virgin installations. An advance streak applied 30 days before the regular chipping season begins will give good early-season yields for the first 8 weeks of the season, but yields for the remainder of the season will be reduced proportionally.

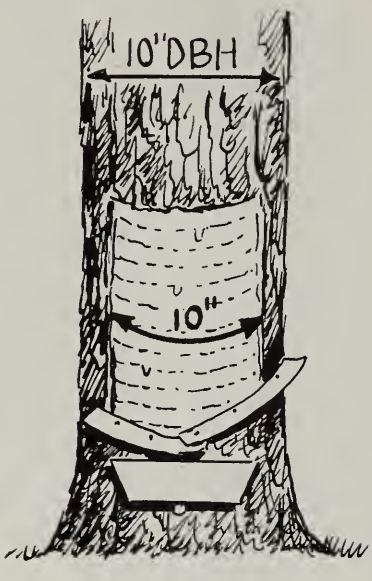
Producers may consider it desirable to produce an increased volume of gum during April and May. There may be a psychological effect in getting something in the cup quickly to spur the interest of chipping and dipping laborers.

The best type of advance streak for good early-season yields is a bark streak $\frac{5}{8}$ - to $\frac{3}{4}$ -inch high, treated with 50-percent sulfuric acid, applied 30 days in advance of the regular chipping season.

TURPENTINING AND GROWTH



Reduction in growth is related to face width. The wider the face, the slower the growth.



Keep face width equal to diameter of tree to prevent excessive loss in growth.

Measurement data covering a 2-year period from a plantation of 20-year-old slash pine, growing at the rate of 8 annual rings per inch, with 15 x 15 foot spacing, and worked with modern gum extraction methods showed that:

The annual volume increment in cubic feet of turpentined trees was 26 percent less than that of round, unworked trees. This reduction in growth was correlated with the width of the face on the tree; the wider the face on a tree of given size, the slower the growth. For normal face width equal to the diameter of the tree, the annual deficit per turpentined tree would be about 2 cents for pulpwood and 5 cents for saw logs, at current stumpage prices. The gross value for naval stores per year would range from 15 to 25 cents per tree.

Growth loss from turpentining was not directly related to the volume of gum extracted from the tree annually. Thus, the extent of growth loss is the same for indifferent work and poor gum yields, as for skilled work and good yields.

BARK CHIPPING

The bark hack removes the outer, rough bark and the white, inner bark, exposing the gum ducts in the wood. Acid is then sprayed on the surface of the wood. The action of the acid holds these gum ducts open for a period of 2 weeks. It is the acid that makes the gum flow from the tree for the 2-week period. Chipping merely prepares the area for acid treatment. It is not necessary to cut into the wood with the bark hack, because a wood streak $\frac{1}{2}$-inch deep will not produce any more gum than a streak of bark depth, both treated with acid.

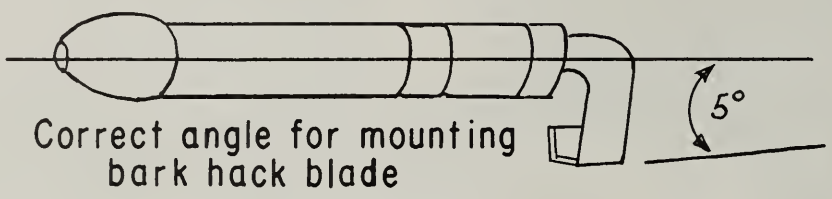
How often to chip and treat. --Treating the streak with acid prolongs the flow of gum; therefore it is necessary to chip and treat only once every 14 days. Chipping and treating every 2 weeks during the chipping season will get practically all of the gum the tree can produce over a period of 4 to 6 years.

Height of streak to chip. --For maximum gum yields over a 4-year period, bark streaks $\frac{3}{4}$ inch high are recommended for both slash and longleaf pine.

MOUNTING AND SHARPENING THE BARK HACK

The bark hack has been designed with a special flat bill, square corners and high jaws to cut through two thicknesses of bark. If it is correctly mounted and sharpened, clean streaks can be chipped and blades will last several years.

The angle (called "pitch") at which the hack head is mounted in the wooden stock helps to prevent chipping into the wood. The best mounting angle for speedy bark chipping is shown below.

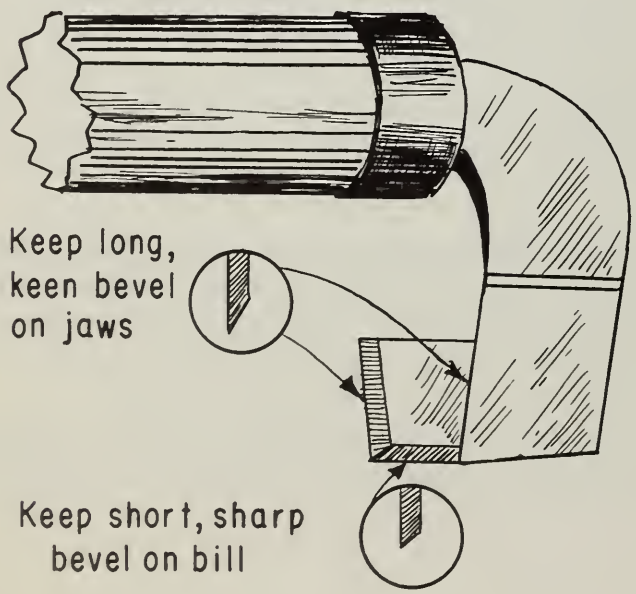


Correct angle for mounting bark hack blade

Proper sharpening of a bark hack blade contributes greatly to the chipping of a clean streak and actually determines how long a blade will last.

A steel cutter may be used to cut out and to thin the edges of a new blade, as illustrated below, but the final sharpening touches should be with a flat file. Do not use the cutter to resharpen the edges; use the flat file or whetstone.

Quite often laborers will file a long, keen bevel at the bill to make wood-cutting easier. But the corners will soon break, leaving large gaps in the blade. The blade should be filed so that the corners are kept square at all times. A rounded or gapped corner will leave patches of inner bark in the streak. These patches of bark will stop the flow of gum from above the streak and reduce monthly yields.



In many instances, poor gum yields from bark chipping and acid treatment have been traced directly to such a simple cause as improperly sharpened hack blades. To reduce the excessive breakage of blades, for speedier bark chipping, and for maximum gum flow from each streak, producers should occasionally check with their laborers on the sharpening and mounting of bark hack blades.

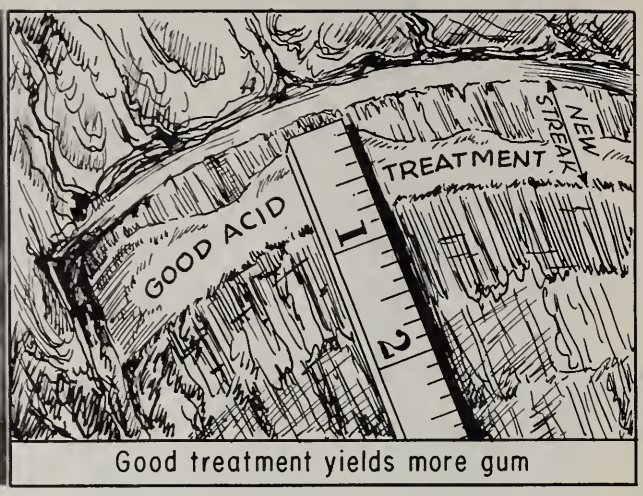
TREATING THE STREAK

The difference between poor and good yields each month is directly related to the amount of acid properly sprayed on each freshly chipped streak.

A 50-percent solution of sulfuric acid is used on both slash and longleaf pine. The plastic bottle of the acid sprayer is filled only two-thirds full, and the sprayer is held at a 45-degree angle for obtaining good treatment. Keep the nozzle tip from 1 to 2 inches below the top of the streak and from 1 to 2 inches away from the tree. Move the sprayer in one steady motion across the streak, spraying enough acid to wet the streak thoroughly from shoulder to shoulder.

The sprayer should be aimed so that the spray from the nozzle hits the streak at the line where bark meets wood. The acid should be discharged from the sprayer in the form of a spray. Normally, a stream of acid does not give good treatment, because a stream hits the streak with force, spatters and the major portion runs down the face as waste.

Good treatment is of vital importance, and laborers must be consistently supervised to assure quality treatment for profitable gum yields.



Good treatment yields more gum

ACID PENETRATION ABOVE THE STREAK

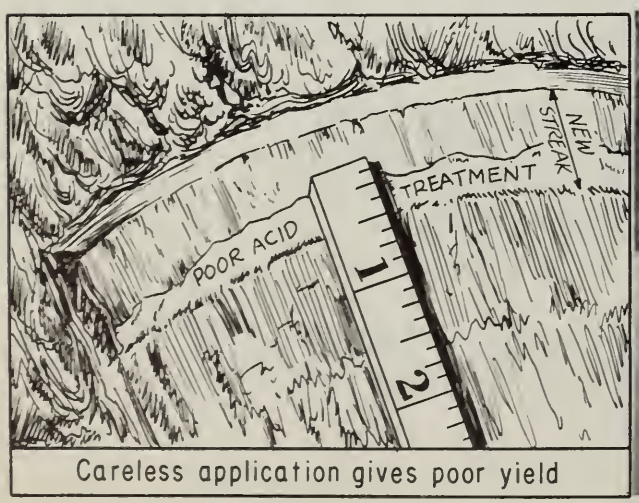
For acid treatment to be effective, the acid must penetrate the area above the exposed wood at the streak line. Acid penetration causes a reddish-brown color in the white, inner bark and on the surface of the wood. Penetration above the streak is necessary and is obtained only by good treatment, in which the streak is wet thoroughly and evenly.

Height of acid penetration. --The volume of gum produced by each streak is directly related to the distance the acid penetrates above the streak; the higher the penetration, the greater the yield. The penetration line and the tissues killed by acid treatment can be seen when the next streak is chipped.

Normally, 50-percent sulfuric acid properly applied in sufficient quantity will penetrate $\frac{1}{2}$ to $\frac{3}{4}$ inch above the streak in 14 days. Good penetration is obtained by using the acid sprayer correctly, as the acid must be sprayed into the top portion of the streak. Through careless application, most laborers waste more acid per streak than is needed for good treatment.

If the height of acid penetration is under $\frac{1}{2}$ inch, then treatment has been poor, and maximum yields will not be obtained from that streak. Poor treatment can usually be traced to careless application.

For best gum yield, the tissues killed by acid penetration should be removed and fresh green wood exposed with each streak chipped. Serious yield decline may result unless the chipping keeps up with the acid penetration.



Careless application gives poor yield

FIRST STREAK IN SPRING REMOVES ACID-KILLED TISSUES

Removal of acid-killed tissues. --To get acid-treated trees in condition for good yields early, it is necessary to remove the killed tissues accumulated over the winter months from the last treated streak of the previous season.

The first streak in the spring removes all the acid-killed tissues, and green wood is visible at the streak line. The streak is then treated with acid, and gum production for the new season is under way. The next regular treated streak follows in 2 weeks.

In a crop of trees, the height of the killed tissues found in each tree in the spring will vary from $\frac{1}{2}$ to $1\frac{1}{2}$ inches. Double-streaking may be required on some trees, while one streak may remove the tissues on other trees.

METAL CUPS, ACID CORROSION, AND GUM GRADES

Water protects a new metal cup better than fresh gum.

Sulfuric acid will attack the zinc coating and seriously damage galvanized-iron cups. Much of the corrosive damage to new metal cups installed on virgin faces has been traced to waste acid running into the cup from the first 2 to 3 streaks of the season.

Fresh gum will not protect the clean surface of a new cup. Acid infiltrates the gum and eats away the zinc coating, exposing the base metal, iron. Iron contaminants get into the gum, and cloudy rosin results. Only one-tenth of 1 percent iron in the ash content of rosin is needed to lower the grade from WW to D.

Ordinary rainwater in a new cup gives very effective protection. Water dilutes the waste acid and spreads the corrosive action, thereby preventing a concentrated attack in any one spot.

Longer life and good gum grades can be obtained with metal cups if new cups are hung early enough so that normal rainfall will half fill the cups before the first treated streak is applied. Many chippers make a practice of emptying cups that are full of water when the first streak is chipped. Since this water will help protect the zinc coating of the new cups, the practice should be stopped.

RAISING TINS INSTALLED WITH DOUBLE-HEADED NAILS

STEP 1

Pulling the double-headed nails.--Pull nails in any order desired except the nail at overlap of gutter and apron, which is pulled last.

Hold the tins at the overlap with the thumb and fingers of the left hand, then pull the lap nail, being careful not to pull the nail completely out of the tins.

Remove the gutter, the apron, and the lap nail from the tree as a unit.

STEP 2

Raising tins to new position. --Raise apron, gutter, and lap nail together as a unit. Position tins accurately on the face of the tree, then drive the lap nail. As this nail is firmly supported in the two tins, it does not have to be held with the fingers while driving it.

The apron on the left and the spiral on the right should extend beyond the shoulders of the face and onto the bark of the tree.

If the spiral gutter does not lap over the apron on the virgin installation, pull all the double-headed nails, then attach the apron first in the raised position. Lap the spiral over the apron and drive the lap nail. As a rule, raised tins will lap much better than on virgin installations.

STEP 3

Driving nails in the tins. --Level the apron and drive the center nail, if used. Then drive the left shoulder nail. Set the spiral gutter at the correct angle for slash or longleaf pine. Drive center nail in the gutter and finally the right shoulder nail. Close any gaps between the tins and face by pounding the inner edge of the tins tight against the face of the tree.

Nails may be redriven in old holes in the tins if the holes are not ripped out or too large. Be careful not to drive the lower head completely through the tin. New nail holes are usually required in tins on both the left and right shoulders of the face.

STEP 4

Pulling the cup nail. --Grasp the hammer handle at the extreme end to obtain more leverage for cup nails. Pull up on the handle, catching the nail in the left hand, then pick up the cup.

For pulling a stubborn cup nail, tap the nail with the driving head of the raising tool. This will break the growth hold of the tree on the nail, making extraction easier.

STEP 5

Completing the installation. --Center the cup under the apron and drive the cup nail at a slight angle. Where only one nail is used, the outer bottom edge of the cup should snap inside the nail head. This will hold the cup tight under the apron and against the tree.

Bend the outer lip of the apron downward at the center by tapping with the hammer head. This will help to hold the cup level and prevent tilting, which occurs sometimes on bark-chipped faces.

BARK PULLING AND ACID TREATMENT

Treating a streak on high faces.

Bark pulling enables a producer to continue the bark removal method into the fifth and sixth years, and to preserve the round trunk of the tree for other wood products.

For good monthly yields from slash and longleaf pine, streaks are pulled every 14 days and treated with a 50-percent solution of sulfuric acid. A bark-pulled streak $\frac{3}{4}$ inch in height, with good acid treatment will produce as much gum as two untreated wood-pulled streaks.

It is dangerous to try to treat high pulling streaks with the hand squeeze sprayer, because the laborer has to stand close to the tree, directly under the streak, and the acid spray blows or drifts down on his head or his clothes. He hurries his pass at the streak with the sprayer to get away from the drift, and poor coverage of the streak usually results.

To avoid all this and provide safety and efficiency, the bark-pulling blade and the acid sprayer have been built into one tool, called the SPRAY-PULLER.

The bark-pulling method requires more skill, patience, and time than bark chipping and treating. The key to obtaining good yields with the bark-pulling method is good treatment of the streaks. The under side of the bark and the fresh streak must be thoroughly wet with acid. Always start treatment at the shoulder and move down to the peak; the stock must be held steady, the aim must be accurate, and movement of the nozzle down the streak must be slow.

HOW TO USE THE SPRAY-PULLER

Spray-pullers are manufactured in three lengths, 36, 48, and 60 inches. Cost varies with the length. All lengths work satisfactorily on low, fourth-year faces. The 48-inch length is recommended for fifth year and the 60-inch length for high, sixth-year work.

The $\frac{3}{4}$-inch jaw of the puller blade rides against the wood of the tree and determines the height of the streak. In applying the pulling streaks, laborers will find that peaked faces will save time and increase the number of faces they can work each day. Slanted streaks require too much footwork in moving around the tree and are more difficult to treat.

It is impossible by hand-squeeze to force acid the length of the stock from bottle to nozzle. To provide easy discharge of acid by hand-squeeze, an acid trap is located at the upper end of the stock. This trap acts as a reservoir and stores enough acid to treat about 30 trees. When the plastic bottle is squeezed, acid is forced from the trap and out the nozzle.

The trap is filled by inverting the tool and pointing the nozzle at the ground. Continuous acid drip at the nozzle will indicate the trap is filled to its capacity. Usually, refilling is done while the laborer walks from tree to tree.

A supply of acid is carried in the plastic bottle located at the lower end of the aluminum stock. Fill this bottle only two-thirds full of acid, as air space must be left at the top of the bottle.

To assure continued satisfactory performance of the spray-puller, fill the bottle occasionally with clean water and flush the entire sprayer mechanism. Remove the nozzle cap and run clean water through the trap to flush out trash that may have been in the acid.

Correct position for using the puller blade.

INTENSIVE GUM EXTRACTION METHODS

Intensive gum-extraction methods have been designed for extracting a good volume of gum in certain situations and under specific conditions. Intensive work is not a substitute for the standard method of gum extraction. In general, intensive gum extraction has only two major applications:

1. For short-term leases where a large volume of gum must be extracted in 2 years just prior to a harvest cut.

   With intensive methods and 16 streaks per year over a 2-year period, gum yields can be increased 25 percent over standard extraction practices in slash and longleaf pine. However, serious yield decline results the third and succeeding years. The chances of insect infestation and tree mortality increase as yields decline. Therefore, intensive chipping and treatment are not recommended for any working cycle longer than 2 years.

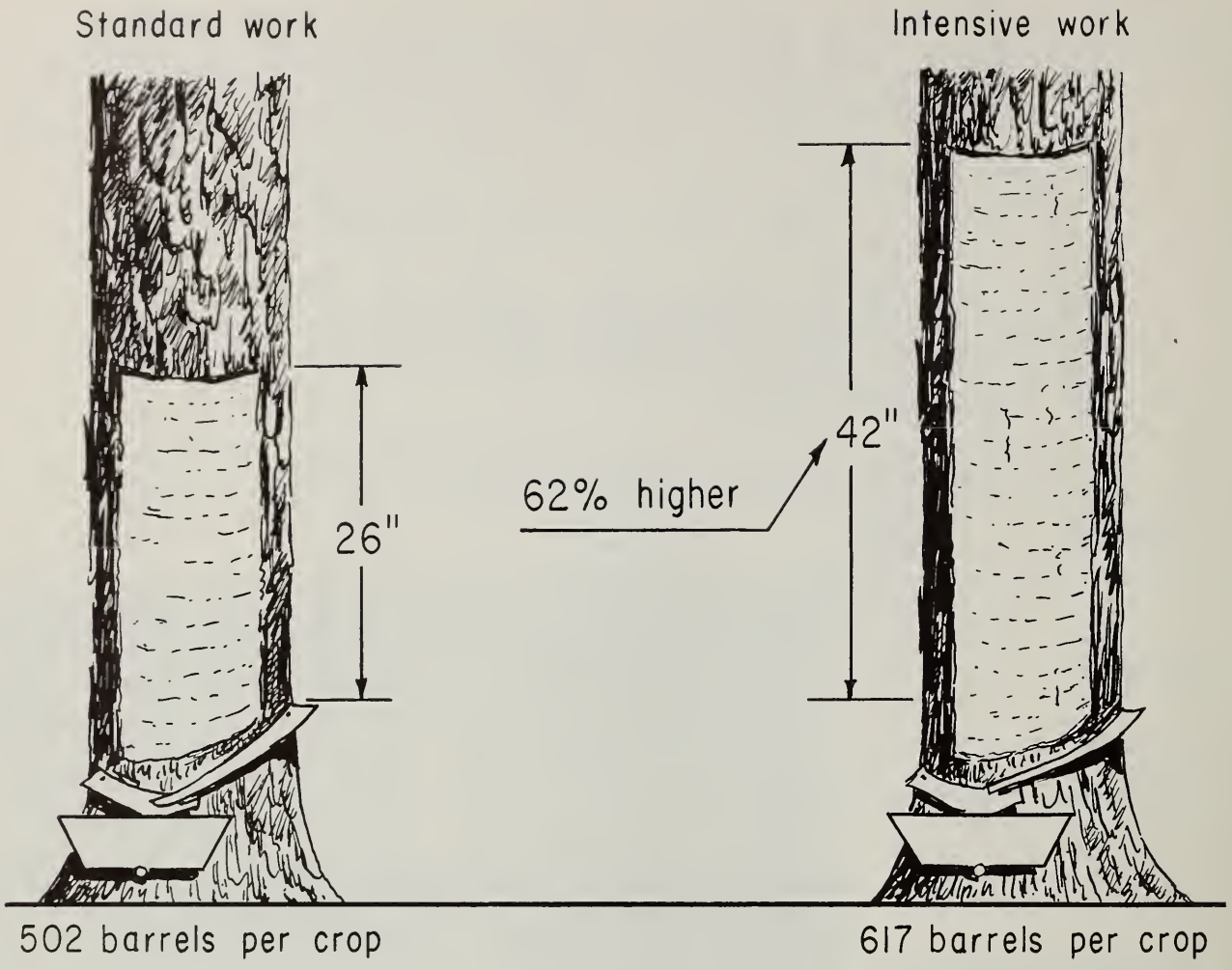
Intensive chipping

2. For gum farming to obtain good yields from a short 12-streak season.

Gum farmers use the intensive method with a short 12-streak season to produce a volume of gum equal to normal production from a 16-streak season with standard chipping and treatment. Where farm laborers are used to work naval stores timber, chipping is delayed 1 month in the spring to permit plowing and planting of row crops. Then chipping is concluded 1 month early in the fall to permit harvest of row crops. A total of 12 intensive streaks will produce a face height 3 inches higher than 16 standard $\frac{3}{4}$-inch streaks, but will reduce chipping time by 25 percent. The important feature of intensive and standard extraction methods are compared below:

Methods	Bark streak height	Streaks per year	Average face height	Sulfuric acid strength
	Inches	Number	Inches	Percent
Intensive	$1\frac{1}{4}$	12 or 16	16 or 21	65
Standard	$\frac{3}{4}$	16	13	50

Standard chipping



COMPARISON OF FACE HEIGHTS AND GUM YIELDS
FOR TWO YEARS OF WORK IN LONGLEAF PINE

Intensive work, sixteen $1\frac{1}{4}$-inch streaks and 65-percent acid treatment, produced 115 barrels of gum per crop more than 16 standard $\frac{3}{4}$-inch streaks with 50-percent acid treatment for the 2-year working cycle.

Two years of intensive work produces a face height about 62 percent higher than standard chipping, so if management plans call for working the timber longer than 2 years, use standard streak heights and 50-percent acid treatment.

TURPENTINED SECTION SUITABLE FOR OTHER WOOD PRODUCTS

The combined aim of modern gum extraction methods is to get the gum from the tree in profitable quantities and leave the worked-out section suitable for sale for other wood products.

If modern installation and extraction methods are followed, the turpentined section of the tree is suitable for most other wood products. Wood-using industries have shown that unburned, bark-chipped, acid-treated turpentine faces free of all metal and promptly harvested are suitable for saw logs, pulpwood, and many other products at full stumpage value.

No wasteful jump-butts when modern extraction methods are used.

Quality lumber sawn from trees turpentined by modern methods. The untrimmed outside edges of each board show that 2 faces were worked simultaneously for 4 years on each tree.

BEETLE ATTACKS AND CONTROL MEASURES

The black turpentine and Ips beetles have caused considerable damage to pine trees in the South during recent years. Both beetles will attack turpentined and round, unworked trees. However, they can be controlled by alertness for the first attack and by early application of correct control methods.

THE BLACK TURPENTINE BEETLE

This beetle usually attacks the tree within 6 feet of the ground and causes large pitch tubes to appear on the trunk. Beetles are most active during the warm months, and two to three broods may develop during a single year. Excessive and deep chipping, mechanical injury, fire, lightning, and drought make trees more susceptible to beetle attacks. Trees worked-out for naval stores should be cut and marketed.

Pitch tubes made by black turpentine beetles.

Chipping laborers usually spot the first beetle attacks in a drift of timber. These first two or three attacked trees should be promptly sprayed with BHC solution. Do not wait until 15 or 20 trees in the drift show signs of attack before control measures are taken. Early detection and prompt spraying of the attacked trees will help prevent a large-scale infestation at a later date.

To obtain effective penetration of the BHC, it may be necessary to remove some of the excessive, rough bark near the base of the tree. The portion of the tree trunk where the beetles are working should be thoroughly sprayed with a BHC-and-oil solution. On faces regularly chipped for gum production, it is advisable to omit the next two streaks. This gives the tree a chance to recover from the beetle attacks and from any adverse effects of the oil spray.

THE IPS BEETLE

The Ips beetle may attack the entire length of the tree or only the top portion. Therefore, it is not always practical to spray standing trees. Early detection is not easy, as the beetles may cause only small pitch tubes or none at all. The best control measure is to keep pine stands in a vigorous condition through a good management program. Infested trees should be cut and removed from the woods; stumps and tops should then be sprayed with BHC solution.

MIXING THE BHC SOLUTION

Purchase a commercial concentrate, specially prepared for beetle control work. This is an oil solution containing 1 pound of gamma isomer of BHC per gallon, usually a 12- to 12.5-percent solution. Mix 1 gallon of this commercial solution with 14 gallons of No. 2 fuel oil to obtain a 1-percent BHC spray for control purposes.

Kerosene or other light oils should never be substituted for No. 2 fuel oil where living trees are to be sprayed, as the substitute oils may kill the trees.

Do not make frequent applications of the oil solutions to the same standing tree. One good application should provide protection for 6 months to a year.

For more detailed information on controlling the black turpentine and Ips beetles contact your nearest Farm Forester, Area Forester, or the Extension Service. DO NOT WAIT UNTIL YOU HAVE A LARGE-SCALE INFESTATION BEFORE MAKING CONTACT. Immediate action in fighting these beetles is very important.

The key to more efficient gum production

GOOD ACID TREATMENT ON EVERY STREAK

SMOKEY SAYS...

REMEMBER
ONLY YOU CAN
PREVENT FOREST FIRES!